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Observation of spiciness interannual variability in the Pacific pycnocline

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Monthly gridded fields predominantly based on global Argo in situ temperature and salinity data are used to analyze the density-compensated anomaly of salinity (spiciness anomaly) in the pycnocline of the subtropical and tropical Pacific Ocean between 2004 and 2011. Interannual variability in the formation, propagation and fate of spiciness anomalies are investigated. The spiciness anomalies propagate on the isopycnal surface σ_θ = 25.5 along the subtropical-tropical pycnocline advected by the mean currents. They reach the Pacific Western Tropics in about 5-6 years in the Southern Hemisphere and about 7-8 years in the Northern Hemisphere. Their amplitude strongly diminishes along the way and only very weak spiciness anomalies seem to reach the equator in the Western Tropics A complex-EOF analysis of interannual salinity anomalies on σ_θ = 25.5 highlights two dominant modes of variability at interannual scale: i) the former shows a variability of 5-7 years predominant in the Northern Hemisphere, and ii) the latter displays an interannual variability of 2 to 3 years more marked in the Southern Hemisphere. The significant correlation of this second mode with ENSO index suggests that spiciness formation in the South-Eastern Pacific (SEP) is affected by ENSO tropical interannual variability. A diagnosis of the mechanisms governing the interannual generation of spiciness in the SEP region leads the authors to suggest that the spiciness interannual variability in the sub-surface is linked to the equatorward migration of the isopycnal outcrop line σ_θ = 25.5 into the area of maximum salinity. Quantitative analysis based on Turner angle reveals the dominance of the spiciness injection mechanism occurring through convective mixing at the base of mixed layer.